DEGREE IN CHEMISTRY

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1. TITLE OF THE THESIS

STUDIES OF INDUSTRIAL WASTE WATER TREATMENT WITH SPECIAL REFERENCE TO BHILAI STEEL PLANT

2. INTRODUCTION

Water is an important compound that covers approximately 75% of the earth's surface, existing in all the three states as solid, liquid and gas. Water is used in many ways from drinking to industrial and agricultural purposes. The aim of process industries is to produce intermediate and final products from raw materials from the earth, water or air. Inevitably there are wastage to be disposed off which must be returned to the environment is such a way as to minimize any adverse effect on it. The quality of water due to the introduction of pollutants is a major problem of industrial area around the world. The uncontrolled releases of waste effluents to large water bodies have affected water quality criteria.

INDUSTRIAL EFFLUENT

Industrial effluent is an out flowing of water or gas from a natural body of water , or from a human made structure. Effluent is defined by the United States Environmental Protection Agency as " wastewater - treated or untreated - that flows out of a treatment plant ,sewer ,or industrial outfall .Generally refers to wastes discharge into surface waters ". Effluents in the artificial sense is in general considered to be water pollution , such as the outflow from a sewage treatment facility or the wastewater discharge from industrial facilities .

Effluents generated by industries are sources of pollution. Contaminated air. Soil, and water by industrial effluents are associated with disease burden and this could be reasons for the current shorter life expectancy in developing countries when compared with developed nations. Chemicals used in industries are highly poisonous because it contains toxic elements . There are some toxic elements present in industrial effluent which direct affect the organ ,which are follows

Table 1: Toxic effect of some elements to living things.

Element	Toxic effects.
As	Peripheral arteriosclerosis (ie black food disease) motor & sensory paralysis of the nerve Extremities, central narcosis and cirrhosis, affects bone marrow and cellular elements of blood, tetragenic to animals.
Cd	Itai ital disease, kidney malfunction, drop in the phosphate level of the blood serum, loss of minerals form the bones and osteomolucea, Osteoporosis, carcenoganic & stetragenic of animals.
Hg	Minamata disease, dryness and irriation innasopharynx and mouth, permanent neurological demage resulting in impaired vision and hearing, sensory loss in limbs, ataxia and tremor, neurological disorders such as mental retardation and convulsive cerebral palsy have been reported to occur in infants whose mothers were exposed to methyl mercury, during pregnancy fetal nerve tissue may be especially sensitive to methyl mercury.
Pb	Weight loss constipation and loss of teeth, gastro-intestinal & hematological disturbance, affect the central nervous system, replace Ca in bones and accumulate as a reservoir for long term release. Ramobilized along with phosphates from the bones.
Se	Animals grazing in seleniferous areas suffers from chronic disease; alkali disease which is characterized by hair loss, soreness of joints, dullness, Sloughing of hoovers etc. In an acute state, the selenosis may lead to a potentially fatal disease called blind sluggers.
Cr	Exposure to Cr (VI) caused allergic skin.

STEEL

Steel is an alloy of pure iron and carbon in which the carbon content varies from about 0.002% (eg, deep -drawing sheet metal) to 1.5% (eg ,tool steel). Alloy steels contain additional elements like Mn, Ni, Cr, V, Mo ,that give them greater strength and specific propertis .In addition to carbon , hot metal & pig iron contain unwanted elements : Si ,P and S.

STEEL INDUSTRIES

Steel plants use a tremendous amount of water for waste transfer , cooling ,and dust control .The plants have sintering mills,coke plants ,electricity and gas for furnaces ,chemical by - products and chemical processes , water cooled rolls , pumps ,slab furnaces ,waste water treatment , transfer lines for sludge and slurries .

The production of iron from its ores involves powerful reduction reactions in blast furnaces. Cooling waters are inevitably contaminated with products especially ammonia and cyanide. Production of coke from coal in coking plants also requires water cooling and the use of water in by-products separation. Contamination of waste streams includes gasification products such as benzene, naphthalene, anthracene, cyanide, ammonia, phenols, crosols together with a range of more complex organic compounds known collectively as polycyclic aromatic hydrocarbons (PAH).

IMPACT OF STEEL INDUSTRY EFFLUENTS ON WATER BODIES

The major pollutional effect of the of the untreated waste water of steel industry if discharge into the receiving water bodies are : toxicity to aquatic life , reduction of D.O silting due to suspended solids ,taste and odor problems ,temperature rise affecting the dissolved oxygen and aquatic life and formation of oil slicks due to floating oil. Toxicity to aquatic life due to ammonia , phenols and cyanide is well known , with the rise of PH value , the concentration of free ammonia increases . Hence ammonia toxicity is particularly severe at high PH .

INDUSTRIAL WASTE WATER TREATMENT

Industrial wastewater treatment covers the mechanisms and processes used to treat waters that have been contaminated in some way by anthropogenic industrial or commercial activities prior to its release into the enviroment or its re-use

.Most industries produce some wet waste although recent trends in the developed world have been to minimise such production or recycle such waste within the production process. However, many industries remain dependent on processes that produce wastewaters.

Steel is exceptionally recyclable material because steel products and by-products are excellent in terms of the "reduce, reuse and recycle" principle. On proper refining, the recyled products compete favorably with natural materials, improve recyling and preserve non-renewable resources. Indian steel industry is yet to reach the high standards achieved by its counterparts in developed world in the arena of waste minimizations and recycling.

3. A BRIEF REVIEW OF THE WORK ALREADY DONE IN THE FIELD

There are so many treatment method for Industrial waste water. Some treatment method are given here, G. lettinga (1980) has given up flow sludge blanket reactor for treatment of waste water. Dani (1996) has given wetland method for waste water treatment. K. Madhavan (2001) has given electrocogulation method for removal of As. Lee (1998) has given method of removal of N_2 with the help of external carbon addition, Welsler (2000) has given high gradient magnetic filtration method for treatment of waste-water. Jibingxiong (2007) has given magnetic separation for treatment of waste water. H. Polat (2007) has given Ion flotation method for the removal of heavy metals. Lili (2008) has given red mud method for waste water treatment.

4. OBJECTIVES OF THE PROPOSED WORK

- Chemical analysis of waste water.
- Study of chemical concentration in waste water.
- Study of chemical concentration of treated waste water.
- Study of treatment procedure for waste water.
- Effect of waste water on environment.

5. NOTEWORTHY CONTRIBUTION IN THE FIELD OF PROPOSED WORK

K. Shivkumar et al (1994) for the analysis of water pollution in surroundings of industrial area of Patancheru Medak, he has taken TDS, BOD, COD, TA, Cu, As, Se, F, Fe parameters . Environment Geology (1999) for the analysis of metals in the Kanpur due to industrial effluents, They have taken Cr, Sn, Zn, Pb, Cu, Ni Cd parameters . Nasrullah et al (2006) for the analysis of heavy industrial effluents at Swabi Pakistan ,he has taken EC, PH, TDS, TSS, BOD, Mn, Cd, Pb, Cr, Cu, Zn, Fe parameters. Shajic et al (2009) for the analysis of water quality in surroundings of Chavara industrial area Quilon Kerala, he has taken BOD, COD, TDS, TH, Nitrate, Calcium, Phosphate parameters. Lawson et al (2011) for the analysis of heavy metals in waste water of Mangrove Swamps of Lagos Lagoon Nigeria, he has taken PH, Salinity, DO, TA, Fe, Zn, Mn, Cd, Cr, Pb parameters. Pravin et al (2011) for the analysis of water pollution by discharge of effluent from Gove industrial area of Maharashtra ,Fe ,Cu, Cr, Cd, Ni parameters . Bhagirathi et al (2012) for the analysis of water quality in Siltara industrial area Raipur ,he has taken PH, EC, TS ,TDS, TA, TH, DO, COD, Cl, F, SO_4, parameters. Vinod et al (2012) for the analysis of water quality in different sites of Bhilai area, he has taken PH ,EC ,TDS ,TSS, COD, Na , K , Cl, So_4 parameters.

6. PROPOSED METHODOLOGY

The water samples will be collected by using standard procedures. The samples will be preserved by keeping the samples in the freezer. The following analytical techniques may be used for measurements of water constituents.

Table 1. Analysis of water constituents

S. No.	Species	Techniques
1	pH	P^H metry
2	Conductivity	Conductometry
3	TS	Gravimetric method
4	TDS	Gravimetric method
5	TA	Titration with HCL
6	TH	EDTA – Titration method
7	DO	Winkler titration method
8	COD	Titrimetric
9	BOD	Titrimetiric
10	cl	Titrimetiric
11	F	Ion Selective method
12	SO_4	Spectorphoto meter
13	EC	Potentiometric method
14	TSS	Gravimetric method
15	Fe, Mg, Ca, Hg, Pb, Zn, Cr	AAS

7. EXPECTED OUTCOMES OF THE PROPOSED WORK:-

- Effectiveness of treatment.
- Quality of treated waste water.
- Effect of treated waste water on environment.

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